

## Director's Comments

It has been a while since our last newsletter. Why, you ask? Distractions, we say - potential realignment of HEC's parent structure, transition to the Corps new electronic financial management system, plus a few other matters. We have not been realigned (yet), our electronic books are now in order, and other matters have been attended to. Therefore, we will get back on schedule with our newsletter. In the spirit of filling the gap in newsletters, and bringing you up to the present on our activities, the remainder of this message is from our FY 1998 Annual Report summary.

Top priorities for FY 1998 were our NexGen software research and development project, the Water Control Data System (WCDS) modernization corporate software development and integration project, watershed and water resource system analysis, and large-scale flood frequency studies. Progress was substantial in all these areas. Customer demand for HEC services and products continues to be high. Several large reimbursable projects resulted in HEC year-end fiscal status at an all-time high. The professional staff remained stable with minor turnover.

The NexGen software research and development project continues at a brisk pace. The project is developing and fielding software tools to help Corps professionals perform their work better, more efficiently, and with increased

ease. We now have released to field offices and the public, maiden release of the River Analysis System - HEC-RAS, followed by several major updates, the latest Version 2.2 is the final steady flow version; maiden Version 1.0 of the Hydrologic Modeling System - HEC-HMS; and maiden Version 1.0 of the Flood Damage Analysis package - HEC-FDA. Work has now begun in earnest on expanding HEC-RAS for unsteady flow; the first release is planned for the end of FY 1999.

An updated release of HEC-HMS is planned for FY 1999 that will include enhancements to the spatial precipitation and runoff modeling capability, continuous soil moisture accounting, and release of a snow melt adjunct software capability under development in cooperation with the Cold Regions Research and Engineering Laboratory. The HEC-FDA is undergoing improvement with a new release planned for FY 1999. New statistical uncertainty analysis, improved database operations, GIS capability, and a number of enhanced user features will be additions for the new release. A beta version of a new reservoir operation program emphasizing real-time decision support was completed and is included in the suite of WCDS software.

A focused project to modernize the Water Control

Data System (WCDS) software began in FY 1997. WCDS is the Corps decision support Automated Information Systems (AIS) that serves the Corps water management mission. It embodies data acquisition, manipulation and management; forecasting, simulation and decision support analysis; and information dissemination. Modernizing the corporate software for WCDS is a five year, five million dollar centrally PRIP funded, Corps AIS improvement project managed under the Corps Life Cycle Management of Information Systems (LCMIS) process. The management structure and design teams form a unique arrangement for providing oversight and field participation in the enterprise-wide development and integration project. A significant

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## TRAINING

### HEC FY 2000 Training Program

The annual PROSPECT survey has begun. We are proposing nine existing and one new course, Hydrologic Analysis for River and Wetland Restoration. The table below lists the proposed courses, dates, and class size. While the survey is for the Corps' offices, **ALL PUBLIC EMPLOYEES CAN APPLY** during the survey process. Priority is given to other Federal, then State and Local agencies.

Course descriptions for existing courses are provided in the "Purple Book" for Corps offices. A short description is provided on HEC's web site for others.  
**Hydrologic Analysis for River**

**and Wetland Restoration** is a new course to provide participants with an understanding of the role of hydrology in river and wetland restoration and to equip them with the tools for the various hydrologic analyses necessary in planning and design of these features. In riverine restoration the quantity of water available, its seasonal timing and duration, river alignment and exposure are some of the principal considerations influencing habitat and wildlife. In wetland restoration the water budget is of paramount importance. This course will focus on what is different in hydrologic processes and in hydrologic analyses that apply to river and wetland

restoration. While methods of analysis for rainfall-runoff, river flow, sediment transport, water quality, groundwater, and water budgets are available for traditional applications, their use in restoration studies requires that both input and output be tailored to the unique requirements of restoration. The course will present a variety of case studies to demonstrate the hydrologic processes involved in restoration and the application of different methods of analysis.  
(Bonner)



### PROPOSED HEC FY 2000 Training Schedule

<u>Control Number</u>	<u>Course Name (Short Title)</u>	<u>Date</u>	<u>Class Size</u>
316	HEC-FDA with Risk	15-19 November 1999	30
152	Hydr Data Mgt/HEC-DSS	6-10 December 1999	30
067	Advanced HEC-RAS	24-28 January 2000	30
219	GIS-Hydrologic Engr	13-17 March 2000	30
345	Flood Warn Prep Prog	10-14 April 2000	30
178	Basic HEC-HMS	8-12 May 2000	30
098	Reservoir Analysis	19-23 June 2000	30
164	Water & Watershed	17-21 July 2000	30
108	Groundwater Model	14-18 August 2000	30
XXX	River & Wetland	11-15 September 2000	30

## FY 1999 Courses Remaining

Classes still remain for the current year's training program. They are listed in the table shown here. To obtain enrollment information, contact Huntsville Training and Operations by calling (256) 895-7421, or writing to:

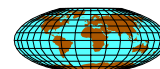
USA Corps of Engineers  
ATTN: CEHR-P-TR  
PO BOX 1600  
Huntsville, AL 35807

### HEC FY 1999 Training Schedule

Control Number	Course Name (Short Title)	Date	Tuition
219	GIS-Hydrologic Engr	12-16 Apr 99	\$1,510
178	Basic HEC-HMS	17-21 May 99	\$1,220
NEW	Water in the Watershed	12-16 Jul 99	Standby
124	Groundwater Hydrology	16-20 Aug 99	\$1,190

## PUBLICATIONS

### Ordering Publications



Corps offices may request documentation via correspondence, e-mail, fax, or telephone. The request must include the recipient's name, office symbol, mailing address and telephone number. Documents should be requested by their HEC number or name.

All others may order from NTIS by writing to: *National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161*, calling their sales desk at (703) 605-6000, or by accessing their web site at <http://www.ntis.gov>.

Some documents are available

on-line and may be retrieved from our web site at:

<http://www.hec.usace.army.mil>

These documents are available in Adobe Portable Document Format (PDF). (*Garcia-Moreno*)



## SOFTWARE

### Release of HEC-1 Version 4.1, June 1998

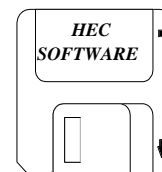
The final release of the Flood Hydrograph (HEC-1) Package is out. This release, dated June 1998, is the official version we now support.

This version of HEC-1 was motivated by the need to put the HEC-1 package in order for a final release during the transition to its replacement, the Hydrologic Modeling System (HEC-HMS). The new release supports a

maximum of 2,000 hydrograph ordinates and contains minor bug fixes to the software and updates to the HEC-1 User's Manual.

Several Data Storage System (HEC-DSS) programs must be loaded separately. The current version of the HEC-DSS package is Version 6-J, dated March 1995. The software and accompanying documents in PDF format are expected to be available to

download from our web site sometime in March 1999. (*Doan*)



## Release of HEC-RAS Version 2.2, September 1998

A new version of HEC-RAS has been released and is now available to the public. Since the last release of the HEC-RAS software (Version 2.1, October 1997) we have found and fixed several bugs. Additionally, a few new features have been added to this version. The HEC-RAS 2.2 software and documentation can be downloaded from our homepage.

The following features have been added (for a complete listing of bugs found in version 2.1 and fixed in version 2.2, please review "readme" file from HEC-RAS download page on our web site):

**Floating Ice and Dynamic Ice Jams.** HEC-RAS now has the ability to model floating ice as well as dynamic ice jams. This option is available from the geometric data editor and is documented in all three of the HEC-RAS manuals.

**Reading data from and writing results to HEC-DSS (HEC Data Storage System).** User can read flow and stage data from HEC-DSS and use it for computing water surface profiles. *(Accomplished from the Steady Flow Data editor: first establish connections between HEC-RAS cross section locations and the DSS file pathnames by using the "Set Locations for DSS Connections" option from File menu of Steady Flow Data editor. Once connections are established, import data by using the "DSS Import" option, also from File menu of Steady Flow Data editor.)* The user can also write computed

water surface profiles to HEC-DSS *(export is accomplished under File menu of main HEC-RAS window).*

**Viewing DSS Data.** User can view data contained in a HEC-DSS file. This option allows the user to graphically plot or tabulate data contained in DSS (it is available from the View menu on the main HEC-RAS window).

**Internal Rating Curves.** The user can now put a rating curve at any cross section. During the computations, the program will take the water surface from the rating curve instead of computing a value. Internal Rating curves are added from the Steady Flow Data editor.

**Increase Number of Profiles.** The number of profiles allowed is higher (incr. from 15 to 100).

**New GIS Data Export Features.** Users can now export the cross section surface lines to the GIS file. Additionally, the user can specify to send the main channel only, or the entire cross section. This feature was added to allow users to supplement their terrain data with surveyed cross section information.

**Improved Picture Viewer.** Now displays the picture filename in the window title. Also, a "copy to clipboard" button was added.

**Improved Boundary Condition Editor.** When a boundary condition in the table is double

clicked, the appropriate dialog editor is opened.

**New Zooming Out and Panning Features.** Graphics - Zooming out has changed meaning. The "Zoom Out" option now doubles the zoom view in height and width. A new option called "Full Plot" was added. When this option is selected, the entire plot is displayed. Also, a "Pan" option was added for moving the graphic around when zoomed in.

**New 3D Graphic Feature.** The user can now rotate the three dimensional graphic while zoomed in on a piece of the river system (previous version zoomed out when attempting this).

**Improved File and Path naming.** The path to the HEC-RAS data directory can now have spaces in it and no longer has a set limit.

**New Cross Section Interpolation Features.** Two methods of specifying distance for cross section interpolation were added: A constant distance interval from the upstream cross section, and a set specific location from the upstream section (this puts in a single cross section).

**Reversing Cross Section Stationing.** Now has option in the schematic editor to reverse the stationing data of the cross section geometry. This was added for those data sets that have the cross sections entered from right to left looking downstream, instead of from left to right. *(Brunner)*

## Release of HEC-5 Version 8.0, October 1998

In February 1999, the HEC-5 Simulation of Flood Control and Conservation Systems, Version 8, October 1998, package of programs was released.

The software and documentation were distributed to supporting COE

offices who have provided model maintenance support funding in support for reservoir modeling, and to those vendors who distribute and/or provide support for HEC-5.

Since the last release of HEC-5 (Version 7.2, March 1991) several

new features have been developed and a greater number of reservoirs, hydropower plants, control points and diversions are allowed. New program features and modifications are described in more detail in the Release Notes that are included in the software package. (*Hurst*)

## Release of HEC-IFH Version 2.01, October 1998

Version 2.01 of the Interior Flood Hydrology program (HEC-IFH) was released for general use in February 1999. It is a DOS program designed to analyze flood damage reduction measures for leveed interior areas. Version 2.01 includes some enhancements and numerous error corrections. The main program

changes include: (1) ability to run under the Windows NT, (2) pump analysis results are now saved with the plan results, (3) input file date stamps are checked prior to displaying the plan results, and (4) pond routing calculations have been refined and increased precision has been added.

HEC will continue to maintain and support HEC-IFH but does not intend to make additional modifications to the program. Interior area analysis capabilities will become part of the Windows-based HEC-HMS program. (*Dotson*)

## Release of HEC-HMS Version 1.1, March 1999

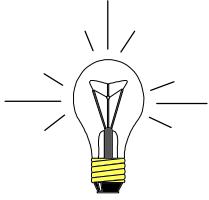
Version 1.0 of the Corps' Hydrologic Modeling System (HEC-HMS) was released in March 1998. Version 1.1 with bug fixes and improvements is expected to be released March 1999. Version 1.1 will have enhanced communication between HMS components, a new installation system, improved time-interval selection, and more error reporting. Bug-tracking software has been implemented to manage the software improvement process and to provide information to users reporting problems and recommendations. Most of the bug fixes were in the screen-to-engine transfer processes; a metric-conversion error in the kinematic wave router was also fixed.

Development of HEC-HMS took place utilizing a mixture of programming languages (C, C++, and Fortran). The software is built for multi-platform usage, primarily workstations and PCs. The computational "engine" and

graphical user interface, GUI, are written in object-oriented C++. Hydrologic process algorithms (e.g., infiltration methods) are written in Fortran and have been incorporated into a library labeled *libHydro*. Although linked into a single executable, there are clear separations between the GUI, libraries, databases and the main simulation engine. This design facilitates use of other components at later dates without having to revise the computational software.

HEC-HMS has most of the capabilities of HEC-1 plus significant new user features and hydrologic methods. In keeping with the conversion to international system units, all computations are performed in metric units. Input data may be English or metric and are automatically converted if necessary. The user selects either English or metric for the output.

A modern graphic user interface greatly facilitates the user's hydrologic analysis. Improved methods are provided for optimization (automated estimation) of selected runoff parameters where observed data are available. The model can simulate runoff on a gridded watershed basis utilizing radar rainfall and GIS and terrain data for subbasin and routing reach definition and estimation of some parameters. A simple continuous soil moisture accounting method is part of Version 1.0. Version 2.0 to be released this summer will include comprehensive soil moisture accounting, and a complementary snow simulation program. Several other major additions are planned for HEC-HMS over the next few years. Watch for an HEC-HMS web page in the near future with all the status and plans information. (*Feldman*)



## OTHER ARTICLES

### NEW HEC Employee

Donna Lydon, an employee for several years in the Planning Analysis Division, resigned to accompany her husband to Vermont. **Dr. David Watkins** was hired to fill that vacancy.



Dr. David Watkins specializes in systems analysis techniques for water resources planning and management.

After receiving B.S. degrees in Civil Engineering and Engineering and Public Policy from Washington University in St. Louis (1991), he continued at the

University of Texas at Austin and received the degrees of M.S. in Environmental Health Engineering (1992) and Ph.D. in Civil Engineering (1997). During graduate school, he participated in numerous studies involving the use of systems techniques for water resources decision support. These included case studies of water quality management in Eastern Europe, storm surge flood protection along the coast of Bangladesh, and drought planning in central Texas.

Dr. Watkins' Ph.D. dissertation focused on techniques for generating alternative solutions which promise to be robust in

light of uncertain data and in commensurate planning objectives. Dr. Watkins is a member of the American Society of Civil Engineers (ASCE), the American Geophysical Union (AGU), the American Institute of Hydrology (AIH), the International Water Resources Association (IWRA), and the Institute for Operations Research and the Management Sciences (IORMS). He serves as a reviewer for ASCE Journal of Water Resources Planning and Management, and he also serves on the Water Resources Systems and International Affairs Committees of the ASCE Water Resources Planning and Management Division. (*Burnham*)

### HEC Interns in FY 1998

The HEC internship program with the University of California, Davis (UCD) is designed to supplement and enhance participating students' education by working in an applied-oriented environment while completing their graduate program. The program has proven to be extremely beneficial to HEC, the students, and to UCD. HEC benefits from the exceptional work, creativity, and energy that the students bring as well as from the connection with the UCD staff. The students benefit from specific research that often leads towards their masters thesis and working on application projects in hydrologic engineering and water resources planning. UCD uses the internship program as a recruiting tool, and a means of relating to the applied research performed at HEC. Last

year's four HEC-UCD Department of Civil and Environmental Engineering graduate student-interns are featured here:

**Dustin Jones** Dustin is from Bakersfield, CA. He completed his undergraduate work with a B.S. degree in Civil Engineering from Fresno State University. He is in graduate school at UCD pursuing a M.S. degree. His emphasis is in water resources and primary interest is in reservoir systems analysis. He is assigned to the HEC's Planning Analysis Division and performs research and applications related to approaches involving optimal water allocations of reservoir systems. Dustin is EIT certified. **Cameron Ackerman** Cameron is a native Californian, having received his B.S. degree in Civil

and Environmental Engineering from UCD in 1997. His interests lie in hydraulics, hydrology, and environmental water quality and is excited about the application of Geographic Information Systems (GIS) approaches to these fields. He previously worked at HEC in the Research Division as a student hire. As an intern, Cameron was assigned to Training Division to work on HEC-RAS generation of spatial flood inundation boundary mapping. Cameron is EIT certified and belongs to the ASCE, AGU, IWRA, and Tau Beta Pi.

**Andreas Krause** Andreas is a graduate student assigned to Technical Assistance Division. He is from Los Alamos, NM, with a B.S. degree in Civil Engineering from Northern Arizona University (1996). He has worked for a private engineering firm and as an

*continued on back of this issue*



## Director's Comments (continued)

accomplishment in FY 1998 includes completion of a fully functional but limited capability, Version 1.0 prototype incorporating aspects of all eight components comprising the modernized WCDS. The prototype and other project documents are available on the WCDS project Web site accessible to Corps offices. Planning was accomplished for Version 1.0 deployment at four selected field office sites early in FY 1999.

Work supporting implementation of risk-based analysis for flood damage reduction studies continued at a steady but reduced pace this past year. In the previous 6 years, 11 PROSPECT courses, 15 on-site workshops and a number of executive and field project working sessions were held for a total of about 1,250 Corps professionals. PROSPECT courses will continue at about one per year for the near-term. HEC-FDA, the new software package written to support this initiative, is now in widespread use by Corps offices. A lessons-learned seminar was held the first quarter of FY 1998; proceedings have been published. Risk-based analysis for flood damage reduction studies is now routinely applied by the Corps. A National Academy of Sciences panel is scheduled to review the Corps use of risk-based analysis beginning in early FY 1999 and HEC will be cooperating with that activity.

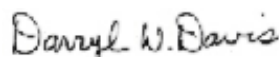
Six PROSPECT courses were conducted for a total of six weeks of training. The courses covered several hydrologic engineering and planning analysis topics. Attendance averaged about 25 students per course. Twelve on-site workshops were also held totaling 7 weeks of sessions for 325 students. This continued the recent trend of reduced PROSPECT sign-ups and increased requests for on-site

workshops. Topics presented included WCDS real-time working sessions, HEC-RAS, HEC-HMS, risk-based analysis, and reservoir operations/HEC-5.

Reimbursable project work was undertaken for 19 Corps field offices as well as HQUSACE, the Institute for Water Resources, Cold Regions Research and Engineering Laboratory, the Federal Emergency Management Agency, Federal Regulatory Commission, a combine of the State of California and Metropolitan Water District of Southern California, and the University of California, Davis. Projects include watershed and reservoir system modeling, water quality, risk-based analysis, river hydraulics, wetlands hydrology, water control management, regional statistical analysis, flood damage analysis, and groundwater modeling. We continued the several years of commitment to the Alabama-Coosa-Tallapoosa, Apalachicola-Chattahoochee-Flint (ACT/ACF) surface water and water quality modeling projects. A critical achievement was the signing of an Interstate Compact by the parties, based in-part on the modeling studies. Several high profile flood frequency studies are being supported on the American River in California, the Des Moines River in Iowa, and the upper Mississippi River. The Bulletin 17B (Federal guidelines for flood frequency) work group and a cadre of University and industry experts are serving as technical advisors to the upper Mississippi flood frequency project under HEC management. Two major water resource system analysis projects were begun late in the year: data compilation and simulation and optimization models for the Sacramento/San Joaquin rivers flood control systems; and data management

and simulation and optimization Panama Canal Capacity study. The total reimbursable program was about \$1.7 million with individual projects ranging from a few thousand dollars to over \$300 thousand.

We expect the HEC program for FY 1999 will continue FY 1998 efforts at the increased pace reflected at the end of the year. We will continue fielding new versions of the NexGen software packages HEC-RAS, HEC-HMS, and HEC-FDA, test version of the new Reservoir Simulation program (HEC-RSS), and initial unsteady flow capability of HEC-RAS. Version 1.0 of the modernized WCDS will be fielded in four Corps offices. PROSPECT training will remain at about six courses and field workshops will likely continue to increase. Research and Development funding is expected to modestly increase, software maintenance and support and WCDS modernization funding remain at FY 1998 levels, and reimbursable technical assistance and special projects continue the upward trend. On balance, the result is expected to be an increase in funding over that of 1998. The reorganization that was expected to impact HEC mentioned in the FY 1997 Annual Report has not yet occurred. Our status is still uncertain, but we are continuing our activities without negative impact, and do not expect to be adversely affected when the change eventually occurs.



DARRYL W. DAVIS, P.E.  
Director

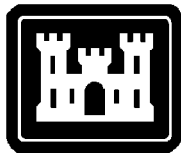
## HEC Interns

(continued)

undergraduate researcher at Los Alamos National Laboratories. His technical interests are in surface water hydrology and fluvial geomorphology.

Andreas is a member of the ASCE, Golden Key, and Tau Beta Pi. He is EIT certified.

**Bryton S. Johnson** Bryton is from the Chico, CA area and has a B.S. degree in Civil Engineering from CSU, Chico. His prior work experience is with the CA Dept of Water Resources, Groundwater and Geology Section. His technical interests are in groundwater contaminant



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transport, physical remediation processes, and bioremediation.

Bryton was assigned to HEC's Research Division and worked on groundwater related topics during his internship. He is a member of the ASCE, AGSE, NSPE, and Tau Beta Pi. Bryton is EIT certified. He completed his MS at UCD and now works

for the Corps' Sacramento District. (*Burnham*)

## DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS, WATER RESOURCES SUPPORT CENTER

### Hydrologic Engineering Center

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